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ENTOMOLOGICAL NEWS

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A New African Microgomphus, and Notes on Some Asiatic Types (Odonata)

By CYNTHIA LONGFIELD, F.R.E.S., London

The first African species to be described belonging to the genus *Microgomphus* Selys was named *M. schoutedeni* by Lt. Col. F. C. Fraser in May 1949 (Rev. Zool. Bot. Afr., 42: 114). The insects had been taken in the Belgian Congo at Kapanga, 1 ♂ Nov. 1932, and Bambesa, 1 ♂ and 1 ♀ May 1938. Up to that time the genus had been considered wholly Oriental.

In November, 1948, Mr. J. A. Whellan of the Dept. Agric. Southern Rhodesia, had captured a single female on the Inyamadzi River, Portuguese East Africa and being unable to classify it, sent it to me in the following spring. The specimen reached me just about the time that *M. schoutedeni* was published. I saw at once that this is a different species, but although the specimen is completely undamaged, it is badly discolored and the exact shape and extent of the pattern is impossible to define. For this reason I am unwilling to name this specimen, although only the second female of African *Microgomphus* known; but I have partially described it later on in this paper.

On May 23rd, 1950, Dr. F. J. O'Rourke of the Liverpool School of Tropical Medicine, caught a third female, of still another species, at the Loiasis Research Scheme, Kumga, BRITISH CAMEROONS, beside a slowly flowing stream in partially cleared forest. This specimen reached me late in July, in a tube of spirit. It was rather damaged in the wings, but the color and pattern were perfectly preserved. I have felt justified in naming this West African specimen, as, in the known species of *Micro-*

gomphus with described females, these very closely resemble the males.

All three of the African females seem to be very closely related, with similar patterns and dimensions and with short vulvar scales. It is deeply to be regretted that only the male of one species is, so far, known.

Microgomphus camerunensis sp. nov.

Female Holotype: (mature). Abdomen + appendages, 27 mm. Forewing, 26 mm. Hindwing, 25 mm. Pterostigma fw. 2.75 mm., hw. 3 mm. Color black, green and citron-yellow.

Head: Labium, lateral lobes, mandible-bases and genae citron-yellow. Two large spots on labrum, anteclypeus and crest of frons citron-yellow, the rest glossy-black as in fig. 1, A. The base of frons, epicranium, antennae and the back of head and eyes, glossy-black. The vertex and occiput reddish-brown, the latter shallowly concave along the raised ridge, which is bordered with an uneven number of very short and irregularly formed black spines, interspersed with a few, sparse, fine, pale hairs. The compound eyes either green or yellow and meeting to within 1 mm. Neck yellow dorsally.

Prothorax: Deeply ridged transversely, raised in the center, with equally prominent anterior and posterior lobes. Black or dark reddish-brown, with citron-yellow laterally on the anterior lobe.

Thorax: Glossy-black dorsally and citron-yellow beneath. The thoracic pattern as in fig. 1, B, the pattern from the dorsal carina to the 2nd lateral suture being green. Also on the dorsum there is a broad green transverse band between each pair of wings.

Legs: Short, the hind femora extending to the beginning of the 2nd abdominal segment and measuring 7 mm. Numerous black spines, not very closely set and gradually lengthening in the center. The inner surface of all the femora is citron-yellow. Tibiae and tarsi are black, coxae citron-yellow.

Wings: All four very slightly tinged with saffron at the bases. Venation black. Pterostigma dark yellowish-brown between

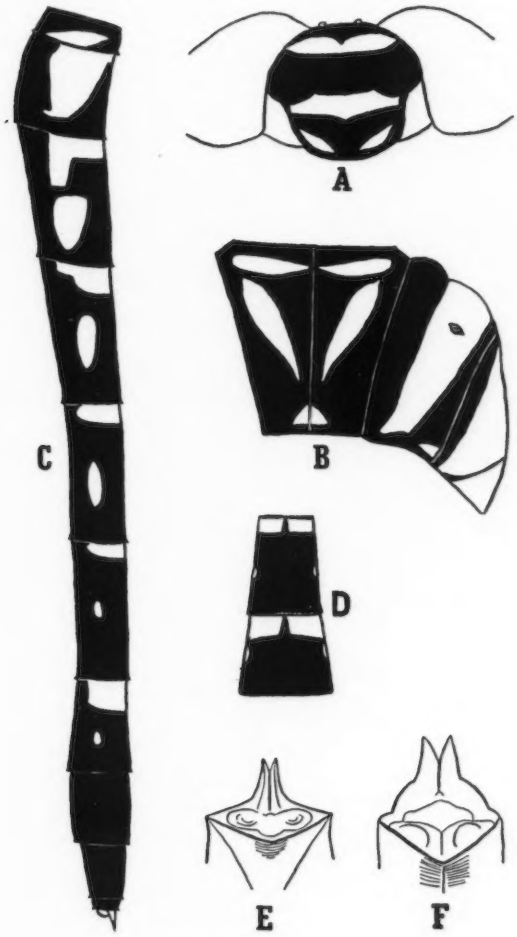

FIG. 1. *Microgomphus camerunensis* sp. nov.

A. Pattern of head from in front. B. Thorax pattern. C. Pattern of abdomen from left side. D. Dorsal pattern of 6th and 7th abdominal segments. E. Vulvar scale. F. The same for the Portuguese E. African ♀.

thick black veins, 0.5 mm. deep and covering 4–5 cells. Antenodals $\frac{14 \mid 15}{10 \mid 10}$, postnodals $\frac{10 \mid 10}{10 \mid 10}$, bridge X-veins $\frac{7 \mid 7}{5 \mid 6}$, cubital anal X-veins(Cuq) $\frac{2 \mid 2}{1 \mid 1}$. 1st and 5th antenodals are the primaries. Arculus at the 2nd antenodal or very slightly distal. Discoidal field in forewings of 6 rows of 2 cells, in hindwings 1 row of 3 cells, then 3 rows of 2 cells. One row of cells along hind margin of forewing from base to 1A, with the exception of 3–4 double cells, 3 cells distant from the apical end.

Abdomen: Glossy-black marked with citron-yellow as in fig. 1, C and D. The dorsal pattern is as follows: Segment 1 is yellow to the first transverse carina and also has a minute spot in center of the black area; Segment 2 has a narrow anterior yellow ring and a yellow spot in the center of the black area, the tiny oreillets are also yellow; Segments 3 and 4 resemble Segment 6 in fig. 1, D, but with the anterior rings complete except for the black dorsal carina, also more of the larger yellow lateral spots can be seen from above; Segment 5 exactly like Segment 6; Segment 7 as in fig. 1, D; Segments 8, 9, 10 black. Abdomen beneath black. Appendages yellow with black tips, 0.5 mm. in length. Length of abdominal segments: 1st, 1 mm.; 2nd, 2.5 mm.; 3rd, 0.75 mm.; 4th, 5th and 6th, 4 mm.; 7th, 3 mm.; 8th, 2 mm.; 9th, 1.75 mm.; 10th, 0.5 mm. Vulvar scale yellow, about half as long as 8th segment and shaped as in fig. 1, E.

M. camerunensis is very similar to *schoutedeni* in color-pattern, but can best be separated by the different shape of the occiput together with the short irregular spines, instead of a fringe of black hairs; also by the shorter hind femora. It has a somewhat similar thoracic pattern to *M. wijaya* Lieftinck (1940) from Ceylon, while the vulvar scale resembles that of *M. thelyphonus* Lieftinck (1929) from Java, but it has very much shorter and broader valves than in *M. torquatus* (Selys, 1854) type female from India.

I would here like to take the opportunity to correct two statements made by Lt. Col. F. C. Fraser in 1934 in volume 2 of *The Fauna of British India,* as to the location of 2 type specimens.

The type of *M. torquatus* (Selys) is not in the Selys collection (Brussels), as stated on page 355, but in the British Museum (Natural History). The type of *Cyclogomphus* [*Microgomphus*?] *minusculus* Selys is not lost, as stated on page 361. It was in the MacLachlan collection and is now in the British Museum (Natural History). This female is neither a *Cyclogomphus,* as now defined, nor a *Microgomphus.* I think it is most likely a *Burmagomphus* Williamson.

The *type* of *Microgomphus camerunensis* Longfield and the *Microgomphus* female from Portuguese East Africa are also in the British Museum (Natural History) having been presented by the respective collectors.

Microgomphus sp.

A mature female from the Inyamadzi River, Portuguese East Africa, 12.11.1948. It differs from *camerunensis* in being a yellower insect. The entire frons and clypeus, also nearly all the labrum are citron-yellow, with only a very narrow blackish basal band across the labrum and a faint indication of a fine black surrounding edge to the lip. The tips of the distalia are yellow in the otherwise black antennae, and the back of the head and eyes is either orange or reddish-brown. The shape, color and armature of the occiput is almost identical. The compound eyes meet to within 1.25 mm. and are orange? in color. The prothorax appears to be unmarked. The dorsal pattern of the thorax is similar to *camerunensis,* but laterally it would appear that the yellow vertical band on the metepisternum is joined below to the yellow metepimerum, leaving a large oval black patch astride the 2nd lateral suture. Legs are more yellow than black; the hind femora measure 7 mm. It would appear that on the abdomen there is more yellow laterally, possibly continuous along the lower edge of the tergites. Beneath, the black of the sternites is somewhat pruinose. Segment 8 would seem to have some yellow laterally, but 9 and 10 are black. The light yellowish-brown anal appendages are very slightly blunter than in *camerunensis,* a bit longer (0.75 mm.) and without black tips. The dimensions of the segments differ slightly: 1st, 1 mm.;

2nd, 2.75 mm.; 3rd, 4th and 5th, 4 mm.; 6th, 3.75 mm.; 7th, 3 mm.; 8th, 2 mm.; 9th, 1.75 mm.; 10th, 0.5 mm.; total length—appendages 27.5 mm. The vulvar scale is yellow and shaped as in fig. 1, F. The wings are slightly tinged all over with greenish-yellow, this may be due to age. Pterostigma reddish-brown, 3 mm. long and 0.5 mm. deep in all wings. The cells beneath are small and variable in number, from 4 to 5½. Antenodals $\frac{15 \mid 15}{10 \mid 9}$, postnodals $\frac{10 \mid 9}{10 \mid 9}$, bridge X-veins $\frac{6 \mid 6}{5 \mid 5}$, cubital anal X-veins $\frac{2 \mid 2}{1 \mid 1}$. The 1st and 5th antenodals are the primaries in the forewings and the right hindwing, 1st and 4th in left hindwing. The discoidal field of the forewing has 6 rows of 2 cells and the hindwing 1 row of 3 cells, then 3 rows of 2 cells. The hind margin of the forewing from base to 1A is all of single cells.

From *schoutedeni* it is easily separated by the yellow face, the different shape and armature of the occiput, the shorter hind femora and the yellow anal appendages.

Correction of a Reference to Mantis religiosa L.

In a note concerning *M. religiosa* in ENTOMOLOGICAL NEWS, 61: 205–207, the writer referred to an article in the 79th Annual Report of the Entomological Society of Ontario, 1948: 41–44, and attributed its authorship to "SMITH, C. W." This citation was incorrect and should have been "JAMES, H. G."—W. W. JUDD, University of Western Ontario, London, Ont.

A Note on the Persistence of a Much-Neglected Primary Antenodal Cross Vein in the Order Odonata [1]

By Hsiu-fu Chao [2] Department of Entomology, University of Massachusetts, Amherst, Massachusetts

During the progress of a study of Chinese gomphine dragonflies I have noticed an antenodal cross vein which has remained heretofore unreported. This vein is hereby called the *basal primary antenodal cross vein* and is denoted by Ax_0 since it is basad of the other two previously recognized primary antenodals, Ax_1 and Ax_2. This vein has been shown in the drawings illustrating the wing bases of the dragonflies by Snodgrass (1908, 1930, 1935), but is not named or discussed.

In order to facilitate the discussion of Ax_0 a description of the costal margin of the dragonfly wing seems necessary. In 1948 Fraser stated: "If the nodal region of the wing of any dragonfly be observed under a moderately high-powered microscope, the subcostal vein will be seen to approach the nodus and then make a distinct curve anteriorwards towards the costal margin, at which level it straightens out again and runs along the lower margin of the costal border of the wing as a distinct tubular structure." Thus under this interpretation, followed here, the part basal to the nodus is C and the part distal to the nodus is a portion of Sc.

The flattened costal vein is gradually twisted a short distance from the base of the wing. Its basal portion is broad, dorsoventrally flattened, dorsally longitudinally grooved, and ventrally correspondingly ridged. In dorsal view an intermediary piece (Snodgrass, 1935, pp. 220–221, *C*) is interpolated between

[1] Contribution from the Department of Entomology of the University of Massachusetts, Amherst, Massachusetts.

[2] I wish to express my sincere appreciation to my teacher, Dr. John F. Hanson, for his invaluable guidance and helpful criticism during the progress of my study. Indebtedness is also due to my friend, Mr. George F. Edmunds, of the University of Utah for information from his extensive knowledge of wing venation and mechanics of mayflies.

the extreme base of the posterior margin of C and the posterior lobe of the humeral plate. Ax_0 is located at the junction between the base of the posterior margin of C and the intermediary piece. It is connected with the ventral ridge of C—a condition which is the same for all other costal cross veins. A part of Ax_0 is dorsally obscured by the posterior margin of C, but its greater portion can be seen as clearly as any other veins.

Structurally Ax_0 is exactly the same as the other two veins, Ax_1 and Ax_2, which are strengthened by what Fraser (1937) called "strongly chitinized membrane." Each so-called chitinized membrane is actually formed by the fusion of two abutting lamellar veins, the costal and the subcostal cross veins. These two portions may be separated along their line of fusion when a force such as that exerted in mounting a wing on a slide is applied. It seems appropriate to point out here that another cross vein having exactly the same kind of structure is present This is a composite cross vein on the ventral surface of the wing consisting of the subcostal cross vein at the nodus and the subnodal cross vein. Its significance in wing mechanics has been pointed out by Fraser (1948).

The membrane of the two cells basal to Ax_0 is thicker than that of other cells and is tinged with brown or other colors in different species; or it may be partly transparent, as is the case in many species of gomphine dragonflies.

The basal primary antenodal cross vein is the most basal of all cross veins yet discovered in odonatan wings. Furthermore, it is the most persistent of the antenodal cross veins, being strongly developed probably in all living species of the order Odonata. The reason for its consistent occurrence may be found in the fact that the base of the costal margin is flexibly connected with the humeral plate and the intermediary piece. It seems logical then that a strong cross vein at the very base of the costal region would be most important for production of rigidity of the fore margin of the wing—a condition which is very essential in the sculling type of flight.

Judging from its position this vein resembles the costal brace of mayflies. However, its actual relationship with the latter

vein is not certain since no sufficient evidence has been obtained regarding homologies of wing bases of mayflies and dragonflies.

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Secondary Sexual Characters on the Legs of Zygoptera (Odonata)

By DOUGLAS ST. QUENTIN, Richard Kralikplatz 2, Wien, Austria

It is known that secondary sexual characters occur on the legs of the male Odonata: In Anisoptera the "tibial-keel" is known and in some genera modified spines as in Cordulegasterinae, in the genera Epigomphus [1] and Leptogomphus.[2] In Zygoptera there occur modifications on the tibiae in form of coloration and dilatation.

In this suborder the modification appears, in some genera and species, as a slight whitish pruinescence on the inner side, the flexor surface, of the tibiae. This pruinescence seems to be an exudate of supra-cuticular pigmentation like the "bloom" of certain fruits. Such pigmentation occurs very frequently on

[1] Calvert, Ent. News XIV, p. 187 (1903).

[2] Laidlaw, Malayan Branch J. Roy. As. Soc. Part II, p. 227 (1926).

different parts of the body of dragonflies and is known as a sign of maturity. The other kind of the modification consists of a light color on this side of the tibiae. Species with a higher degree of the modification and species with whitish legs, show, in some cases, dilated tibiae.

The purpose of this modification is cleared up by the observations of several authors, such as Poulton, Laidlaw, Lieftinck and Fraser; "the males perform a kind of nuptial dance before the female, during which they make a great display of the white pulverulent flexor surface of the hinder pairs of tibiae," says Fraser.[2]

In Anisoptera sexual characters of such kind are unknown. Pruinescence occurs very commonly on the thorax or other parts of the body, but never on the tibiae.

The modification is found in six genera, belonging to two systematic groups: They are the Epallaginae Laidlaw with the genera *Libellago* Selys (= *Micromerus* Rambur), *Chlorocypha* Fraser, *Rhinocypha* Selys, and the Platycnemididae Fraser with the genera *Copera* Kirby, *Proplatycnemis* Kennedy, *Platycnemis* Charp.

Libellago Selys shows, in the most species, a light pruinescence on the inner side of the tibiae. The tibiae are slightly dilated in about 1/10 of their length. Unmodified tibiae occur like *L. miae* Lieftinck or *L. dorsocyana* Lieftinck. In all six genera there also occur species with unmodified tibiae; therefore, it seems that the modification has a separate origin and has developed independently in each genus.

Chlorocypha Fraser is closely allied to *Libellago*. The genera were established by Fraser 1928 for the African species of the old genus *Libellago*. In this genus the inner side of the tibiae is light-colored without pruinescence. *C. rubida* Hagen shows unmodified tibiae. *C. tenuis* Longfield shows a green stripe on the inner side of the black tibiae, perhaps the first step of the modification. *C. curta* Hagen has the tibiae on the inner side light colored, *C. caligata* Selys has the red tibiae that are dilated 1/7 of their length.

[3] Lieftinck Follow, Treubia XIV, p. 386 (1934).

In *Rhinocypha* Selys a pruinescence is found as in the genus *Libellago* Selys, but only the middle- and hind-tibiae are modified. *R. pelops* Laidlaw has unmodified tibiae, *R. phantasma* Lieftinck has the tibiae basally dark and distally light. The most species show a whitish pruinescence on the tibiae and the tibiae are slightly dilated *ca.* 1/10 of their length.

In the Platycnemididae Fraser, likewise, only the middle- and hind-tibiae are modified. The same is true of the sexual characters on the legs of Anisoptera. It seems that the various functions of fore legs, like holding the food, cleaning eyes and mouthparts, make them unusable for other adaptations.

The three genera *Proplatycnemis* Kennedy, *Platycnemis* Charp, and *Copera* Kirby are very closely related. *Proplatycnemis* has been separated by Kennedy 1920 [4] for two species of *Platycnemis* from Madagascar; *Platycnemis* and *Copera* were once put [5] in one genus.

Proplatycnemis agrioides (Ris) shows the tibiae black with a bright bluish stripe on the inner side. It seems to indicate that the whitish legs of the *Platycnemis* have arisen from a type with black legs. The tibiae of *P. agrioides* are slightly dilated.

In the genus *Copera* Kirby, the species show orange to whitish tibiae. Species with unmodified tibiae also occur, such as *C. imbricata* (Selys). Following Lieftinck 1940,[6] *C. vittata* (Selys) and its subspecies show all degrees of the modification from unmodified tibiae to strongly dilated ones.

The typical subspecies *C. vittata vittata* (Selys) inhabits the southern Malay States, a part of Sumatra and all Borneo. The tibiae are not noticeably dilated. Subspecies with strongly dilated tibiae are *C. vittata serapica* (Selys), confined to the Nikobar Islands, and *C. vittata javana* Lieftinck from the wooded districts of south Java. It is very remarkable that both subspecies with strongly dilated tibiae inhabit rather restricted areas. Isolation seems to advance the modification. In Sumatra there are found *C. vittata vittata* (Selys), *C. vittata acutimargo* (Krüger) and *C. imbricata* (Selys) all with undilated tibiae.

[4] Kennedy, J. Ohio Sci. 21, p. 85 (1920).
[5] A Manual of Dragonflies of China, p. 248 (1930).
[6] Lieftinck, Treubia XVII, pp. 281–2306 (1940).

In Borneo occur *C. vittata vittata* (Selys) and *C. vittata palavana* Lieftinck, both with tibiae not noticeably dilated. In Java occur *C. annulata* (Selys), *C. marginipes* (Rambur) and *C. vittata javana* Lieftinck, all with dilated tibiae. It seems that the great islands, Sumatra, Borneo, and Java, has each its particular type of *Copera*. Sumatra and Borneo species and subspecies without, Java species with dilated tibiae.

The genus *Platycnemis* Charp. presents marked variations. The legs of the species are whitish, but it is probable that they are derived from a type with dark legs like *Proplatycnemis* Kennedy. The African species *P. nyansana* Förster shows only slightly dilated tibiae, *ca.* 1/10 of their length. From this type to the type with the highest degree of the modification, *P. foliacea* Selys with 1/3 dilatation, all intermediate steps can be found. In this genus the modification reached an additional degree. In some species the modification appears in the same form on the females also.

In *P. pennipes* Pal. the tibiae of the females are also a little dilated. In *P. latipes* Selys the tibiae of the females are just as strongly dilated as in the males, *ca.* 1/7 of their length. The secondary sexual character has become a specific character.

The development of the modification is easy to follow. The origin may show a type like *Libellago* or *Rhinocypha* with a thin pruinescence on the tibiae, more a physiological sign of maturation than a morphological character. This pruinescence can become, in some forms, a thick stratum and finally, in addition, there is a dilatation of the tibiae. *Chlorocypha* or *Platycnemis* follows a different path. The first step may be indicated by a light stripe on the inner side of the dark tibiae. Then the tibiae became a light color and dilated. In these forms dilatation reaches its highest degree. In some species, but not in the species with the most dilated tibiae, the modification appears also in the females. Thus, the development of this modification resembles the development of antlers in the Cervidae. In this family most genera possess antlers as sexual characters of males. Only in some primitive genera like *Moschus* or *Hydropotes* are antlers lacking. In the genus *Rangifer* the sexual character has become of specific rank, and both sexes have antlers.

Records of some Virginia Odonata

By Leonora K. Gloyd, Illinois Natural History Survey, Urbana, Illinois

This report is based primarily on the dragonflies taken on a brief trip, sponsored by the University of Michigan, to Virginia in September 1934. It is supplemented by a list of species in the collection of the Virginia Polytechnic Institute at Blacksburg, and by a recent collection received from R. L. Hoffman of Clifton Forge. Several species, although rather common, have not previously been reported for the state.

Southeastern Records

On September 11, 1934, after a memorable visit with Doctor and Mrs. Calvert in their home at Cheyney, Pennsylvania, H. K. Gloyd and I set forth on a collecting trip to southeastern Virginia. Heavy rains had fallen during the first two weeks of September throughout most of the state and with additional rains at night, cloudy skies during most of the daylight hours, wet vegetation, and flooded streams, ponds and swamps, we found conditions for collecting dragonflies far from ideal. Our first stop was made, on the morning of September 12, at Falling Creek, 5 miles south of Richmond where we saw only three *Boyeria vinosa* (Say) and one male *Hetaerina titia* (Drury), all flying erratically and apparently excited by the torrential waters of the flooded stream. It was not possible to get within swinging distance of these dragonflies. The *Hetaerina* was shot and caught as it floated downstream within reach.

Our first camp was made in a grove of trees in the vicinity of Cypress Chapel, Nansemond County, near the western edge of the Dismal Swamp. A few hours of sunshine in the morning on September 13 and 14 and for most of the afternoon on the latter day furnished the only good flying weather for dragonflies during our stay of several days. A nearby peanut field, bordered on the south and west by woods, on the north by a clearing in which sat an abandoned house, and on the west by

a small corn patch, was frequented by *Pantala flavescens, Tramea carolina,* and *Somatochlora filosa.* They seemed to be feeding on small insects which arose from the heavy foliage of the peanut plants. The Somatochloras flew low except when one was near with a net. Toward evening the height of their flight kept pace with the upsurging swarms of midges and by seven o'clock in the evening the Somatochloras were at treetop level with only an occasional low flight. One male was caught while he was patrolling a road between timbered areas. *Anax junius, Libellula vibrans,* and *Erythemis simplicicollis* were taken near the abandoned house and at the edge of the cornfield.

A ditch along a fairly well-shaded portion of the road served as the habitat for *Anomalagrion hastatum, Ischnura posita* and *Nehalennia integricollis.* A female *Ischnura posita* attracted my attention because she was flying about with a portion of a male abdomen still attached to her prothorax—mute evidence of sudden tragedy.

The dragonfly population was greatest at a nearby flooded swamp pond. On the cloudy afternoon of September 13, *Lestes vigilax* was abundant in the cattails and marginal vegetation. Other species of Zygoptera were rare. Of the Anisoptera, *Pachydiplax longipennis* and *Erythemis simplicicollis* were rather common. The following morning was bright and warm with sunshine. At 10:00 o'clock only a few *Lestes vigilax* and *disjunctus* were found hanging up and an occasional *Enallagma* was seen. About noon several species of Zygoptera, as well as *Perithemis tenera* and *Pachydiplax longipennis,* came out in considerable numbers. There were many mating pairs of *Enallagma dubium* on the lily pads but most were too far out to reach without wading beyond one's depth. About one o'clock they began to fly toward the edge of the pond and I went in pursuit of a pair. When I again turned back toward the center of the pond, not a zygopteran was to be seen. They had all vanished as if by a common signal. I do not know whether this was due to the intensity of the hot noon-day sun or to the appearance of greater numbers of *Erythemis* and *Libellula.*

The following is a complete list of species we obtained in Nansemond County:

Anomalagrion hastatum (Say). Sept. 13, 1 ♀; Sept. 14, 6 ♂, 2 ♀.

Enallagma dubium Root. Sept. 14, 5 ♂, 5 ♀.

Enallagma geminatum Kellicott. Sept. 13, 2 ♂; Sept. 14, 10 ♂, 3 ♀.

Enallagma signatum (Hagen). Sept. 14, 1 ♂, 1 ♀.

Ischnura posita (Hagen). Sept. 13, 8 ♂, 8 ♀; Sept. 14, 2 ♂, 6 ♀.

Lestes disjunctus Selys. Sept. 13, 1 ♂, 1 ♀; Sept. 14, 2 ♂, 2 ♀.

Lestes vigilax Hagen. Sept. 13, 42 ♂, 35 ♀; Sept. 14, 14 ♂, 3 ♀.

Nehalennia integricollis Calvert. Sept. 14, 1 ♂.

Erythemis simplicicollis (Say). Sept. 13, 1 ♂, 2 ♀; Sept. 14, many seen.

Erythrodiplax minuscula (Rambur). Sept. 13, 2 ♂; Sept. 14, 1 ♂.

Libellula incesta Hagen. Sept. 14, 2 ♂.

Libellula vibrans Fabr. Sept. 13, 1 ♀.

Pachydiplax longipennis (Burm.). Sept. 13, 8 ♂; Sept. 14, 5 ♂, 1 ♀.

Pantala flavescens (Fabr.). Sept. 14, 1 ♂. Rather common at times.

Perithemis tenera (Say). Sept. 14, 1 ♂. Several seen.

Sympetrum vicinum (Hagen). Sept. 14, 1 ♀.

Tramea carolina (Linn.). Sept. 14, 5 ♀. Many more seen.

Somatochlora filosa (Hagen). Sept. 13, 1 ♂; Sept. 14, 4 ♂, 3 ♀.

Anax junius (Drury). Sept. 13, 1 ♀. Others were seen on this date and the following day.

Other species to be recorded from southeastern Virginia are as follows:

Ischnura verticalis Say. Douthat State Park, Bath County, May 24, 1950, 1 ♀, R. L. Hoffman.

Erythrodiplax berenice (Drury). Virginia Beach, Princess Anne County, June 9, 1948, 3 ♂, 3 ♀, G. M. Boush (Va. Polytech. Inst.).

Western Records

The search for favorable weather and suitable collecting grounds as we drove westward across the state was without success until we reached the mountains in Alleghany County. Small streams in the vicinity of Long Dale looked beautiful but

dragonfly life was conspicuously absent. On September 18, after a cold night, the day was warm and blessed with sunshine and a few clouds. Two hours were spent on Simpson Creek, a stream of considerable fall and swiftness, with rocky bottom and occasional spots of coarse gravel, and with many deep holes. It ranged from ten to twenty feet wide and from six inches to three or more feet deep. In the region where we visited it there was a high bank on one side and tall shrubs, frequent alders and other trees grew on the other bank. Only four specimens, representing three species, were taken but the beautiful surroundings and the one new state record, *Boyeria grafiana,* made the time seem well spent.

On September 19, about one mile southeast of Clifton Forge, at a turn in the highway we suddenly came upon an interesting site and stopped for about an hour to collect. Twenty or thirty feet below the road was a rather large pond approximately two-thirds as wide as, and a little longer than, a city block. The north and west sides were formed by the steep roadgrade, the east and south banks were the more sloping sides of a mountain. We worked from the west side where the vegetation was rather dense. Small willows and other first-growth trees produced overhanging limbs and made dry land collecting difficult. Water vegetation was abundant but nevertheless wading was treacherous as the pond bottom was soft and full of holes and irregularities. *Enallagma civile* was extremely abundant and mating pairs were seemingly flying by the hundreds. *Argia violacea, Ischnura verticalis,* and *Sympetrum vicinum* were also mating. *Erythemis simplicicollis* and *Libellula incesta* were seen but little effort was made to collect them as they were wary and we had little time. We saw only the one *Aeshna umbrosa* ♀.

The specimens we collected in Alleghany County are listed below together with those taken recently by Richard L. Hoffman (RLH) from the same county.

Argia moesta (Hagen). Griffith, along Cowpasture River, in fallow field, June 6, 1950, 1 ♂ (RLH).

Argia violacea (Hagen). 1 mi. S.E. of Clifton Forge, Sept. 19, 1934, 3 ♂, 1 ♀. Griffith, June 6, 1950, 1 ♂ (RLH).

Enallagma civile (Hagen). 1 mi. S.E. Clifton Forge, Sept 19, 28 ♂, 15 ♀.

Enallagma geminatum Kellicott. 1 mi. S.E. Clifton Forge, Sept. 19, 3 ♀.

Enallagma signatum (Hagen). 1 mi. S.E. Clifton Forge, Sept. 19, 2 ♀.

Ischnura verticalis (Say). 1 mi. S.E. Clifton Forge, Sept. 19, 2 ♂, 4 ♀. Pond at Selma, May 24, 1950, 2 ♀ (RLH).

Ischnura posita (Hagen). 1 mi. S.E. Clifton Forge, Sept. 19, 3 ♂, 8 ♀.

Pachydiplax longipennis (Burm.). Griffith, on pond, May 18, 1950, 1 ♂ (RLH).

Plathemis lydia (Drury). 1 mi. S.E. Clifton Forge, Sept. 19, 1 ♂, 1 ♀. Long Dale, on Simpson Creek, Sept. 18, 1 ♀.

Sympetrum vicinum (Hagen). 1 mi. S.E. Clifton Forge, Sept. 19, 8 ♂.

Somatochlora tenebrosa (Say). 2½ mi. S.E. of Long Dale, elev. about 2500 ft., Sept. 18, 1 ♂. Flying above a sawdust pile at an old mill site.

Tetragoneuria cynosura (Say). Pond at Selma, May 24, 1950, 2 ♂ (RLH).

Boyeria grafiana Williamson. Long Dale, on Simpson Creek, Sept. 18, 1 ♂.

Boyeria vinosa (Say). Long Dale, on Simpson Creek, Sept. 18, 1 ♂, 1 ♀.

Gomphus lividus Selys. Pond at Griffith, May 18, 1950, 1 ♂ (RLH).

Gomphus quadricolor Walsh. Pond at Griffith, May 18, 1950, 1 ♂ (RLH).

V. P. I. Records

For the following additional records for western Virginia I am indebted to Mr. E. W. King of the University of Illinois and to Prof. James McD. Grayson, of the Department of Biology, Virginia Polytechnic Institute, who kindly sent all of the Odonata in the collection there for identification. All specimens were taken in 1948 on the College Pond on the campus at Blacksburg, Montgomery County, unless otherwise indicated. They were collected by G. M. Boush (B), T. K. Burton (TKB), L. B. Cochran (C), E. C. Cockrell (EC), G. E. Crist (GC), W. E. Ellis (E), J. M. Grayson (G), E. W. King (K), P. S. Smith (S), and ? Walker (W). According to Mr. King the

specimens without data were also collected at Blacksburg, probably in 1948.

Calopteryx maculata (Beauv.). May 23, 1 incomplete ♀ (C); May 27, 1 ♀ (EC); June 20, 1 ♀; June 21, 1 ♂; July 8, 1 ♂ (B); July 10, 1 ♂.

Amphiagrion saucium (Burm.). May 10, 1 ♀ (E); June 25, 1 ♀ (B).

Enallagma civile (Hagen). May 10, 1 ♂ (E); May 12, 1 ♀ (W); May 17, 1944, 1 ♂ (GC); June 20, 2 ♂, 1 ♀; July 2, 1 ♂ and July 8, 1 incomplete ♂ (K).

Enallagma doubledayi (Selys). April 15, 1 ♂ (EC).

Ischnura verticalis (Say). April 22, 1 ♂ (EC); May 6, 1 ♂, 1 ♀ (S); May 10, 1 ♀ (E); May 21, 1 ♂, 1 ♀ (TKB); June 20, 1 ♂, 3 ♀; June 25, 1 ♀ (B).

Lestes disjunctus Selys. May 6, 1 ♂ (EC).

Celithemis elisa Hagen. Mountain Lake, Giles County, June 20, 1 ♂ (B).

Erythemis simplicicollis (Say). July 22, 6 ♂, 1 ♀ (B).

Libellula luctuosa Burm. May 27, 1 teneral ♀ (EC); June 20, 1 teneral ♀ (B); June 23, 1 ♂ (B); June 25, 2 ♂, 2 ♀ (B); July 3, 1 ♂ (B).

Libellula pulchella Drury. June 23, 1 ♂ (B).

Pachydiplax longipennis (Burm.). May 7, 1 ♂ (S); May 10, 1 ♀ (E); May 15, 1 ♂ (EC); June 20, 1 ♂; June 25, 2 ♂, 1 ♀ (B).

Plathemis lydia (Drury). May 15, 1 ♂ (EC); May 20, 2 ♂, 1 ♀ (B); May 27, 1 ♀ (EC); June 23, 1 ♀ (B).

Perithemis tenera (Say). June 25, 1 ♂ (B); July 3, 1 ♂ (K); July 10, 1 ♂ (B); July 22, 1 ♀ (B).

Sympetrum rubicundulum (Say). July 2, 1 ♀ (G); July 22, 2 ♂ (B).

Sympetrum semicinctum (Say). July 8, 1 ♂ (B).

Tramea lacerata Hagen. May 13, 1 ♂ (EC); June 25, 1 ♂ (B); July 10, 1 ♂ (B); no data, 1 teneral ♂.

Somatochlora tenebrosa (Say). No data, 1 ♂.

Tetragoneuria cynosura (Say). May 15, 1 ♂ (EC); July 10, 1 ♂ (B).

Aeshna umbrosa Walker. Sept. 1939, 1 ♀ (G); no data, 1 ♂.

Anax junius Drury. April 15, 1 ♂, 1 ♀ (EC); May 20, 1 ♂ (B).

Basiaeschna janata (Say). No data, 1 ♂.

Epiaeschna heros (Fabr.). May 13, 1 ♂ (W).

Gomphus lividus Selys. May 20, 1 ♂ (B).

The Hibernation of Bombus impatiens Cresson (Hymenoptera: Bombidae)

By Lee H. Townsend, College of Agriculture and Home Economics, University of Kentucky

The most important observations on the hibernation of this species were published by Plath (1927). The observations and experiments of this investigator carried out in New England established the fact that young queens of this species, under normal conditions, hibernate in the soil about the entrance to the maternal nest. He relates finding from 13 to 40 queens hibernating in a small space near the entrance of a former nest. These same observations, without important additions, were published by Plath (1934) in his important book on bumblebees.

Frison (1929) published an important contribution to the knowledge of this species as observed in central Illinois but was never successful in finding hibernating queens. He commented upon Plath's (1927) observations and added "these observations confirm a story told me by a young eastern entomologist, whose name I have forgotten, that he once found nearly a hundred queens of *B. impatiens* hibernating in a small area in sandy soil near New York City."

On account of the rather scanty information available on the hibernation of this species the writer believes the following incident is worthy of presentation.

On March 13, 1948, some workmen were clearing out an osage orange (*Maclura pomifera* (Raf.) Schneid.) fence-row near Georgetown, Kentucky. Several bumblebees were noticed lying in the soil as though in a stupor. As digging continued more specimens were uncovered, all in separate locations. An area of approximately 3 square feet was carefully dug 2 to 4 inches deep and examined. As a result, 86 hibernating queens of *Bombus impatiens* Cresson (Det. Burks, Illinois Nat. Hist. Survey) were found. The soil was loose and fertile without much grass but pervaded by many Osage orange roots. All the queens were in a stupor when found but began to revive as they were handled. These seemed to be all the specimens in this

immediate area. No effort was made to find the site of a former nest.

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Current Entomological Literature

COMPILED BY R. G. SCHMIEDER.

Under the above head it is intended to note papers received at the Academy of Natural Sciences of Philadelphia and the University of Pennsylvania, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

This list gives references of the year 1950 unless otherwise noted. Continued papers, with few exceptions, are recorded only at their first installment.

For other records of general literature and for economic literature, see the Bibliography of Agriculture, Washington, and the Review of Applied Entomology, Series A, London. For records of papers on medical entomology see Review of Applied Entomology, Series B.

NOTE: The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the List of periodicals and serials published in our January and June issues. The number of the volume, and in some cases, the part, heft, &c. is followed by a colon (:). References to papers containing new forms or names not so stated in titles are followed by (*); if containing keys are followed by (k); papers pertaining exclusively to Neotropical species, and not so indicated in the title, have the symbol (S).

Papers published in ENTOMOLOGICAL NEWS are not listed.

GENERAL—Dobzhansky, T.—Mendelian populations and their evolution. [3] 84: 401–18. **Fisher, R. S. and F. O. Morrison**—Methods of rearing and sexing Musca domestica L. [80th Ann. Rpt. Ent. Soc. Ontario] pp. 41–45, ill. **Gregg, J. R.**—Taxonomy, language and reality. [3] 84: 419–35. **Mařan, J.**—Le role important de la variation géographique des insectes pour les questions zoogéographiques et évolutives. [Acta Ent. Mus. Nat. Pragae] 23: 23–87 (French summary, 78–83), 1945. **Mell, R.**—Artbildung durch physiologische Differenzierung (chemotaktische Antizipation) in der Gattung Rhopalocampta Wall (Lep., Hesperidae). [Bonner Zool. Beitr.] 1: 86–91, ill. **Newby, W. W.**—Histological techniques applied to insects (Abstract). [Proc. Utah Acad. Sci.] 25: 165–66, 1948. **Nielsen and Nielsen**—Migration. (See under Lepidoptera.) **Kullenberg, B.**—Observations sur Ophrys et les Insectes (Orchidaceae and Hymenoptera). [Bull. Soc. Sci. Nat. Maroc]

28: 138–41, ill. **Rensch, B.**—Die Abhängigkeit der relativen Sexualdifferenz von der Körpergrösse (Coleoptera). (Birds, mammals and insects (Col.).) [Bonner Zool. Beiträge.] 1: 58–69. **Weber, N. A.**—A survey of the insects and related arthropods of arctic Alaska. [83] 76: 147–206. **Wellington, W. G., J. J. Fettes, K. B. Turner and R. M. Belyea.**—Physical and biological indicators of the development of outbreaks of the Spruce budworm, Choristoneura fumiferana (Lep. Tortr.). [24] Sect. D, 28: 308–31, ill.

ANATOMY, PHYSIOLOGY, MEDICAL—Arvy, L., M. Gabe et J. L'Hoste—Contribution a l'étude morphologique du sang des Mantidae. [Rev. Canad. Biol.] 8: 184–200, 1949. **Balduf, W. V.**—Utilization of food by Sinea diadema (Fabr.) (Reduv.). [5] 43: 354–60. **Beck, S. D., N. M. Bilstad and J. H. Lilly**—Prepupal changes in the ventricular epithelium of the European corn borer, Pyrausta nubilalis Hbn. [5] 43: 305–10, ill. **Black, L. M.**—A plant virus multiplies in its insect vector. [53] 166: 852–53. **Broadbent, L., R. P. Chaudhuri and L. Kapica**—The spread of virus diseases to single potato plants by winged aphids. [4] 37: 355–61. **Caspari, E.**—On the selective value of the allels Rt and rt in Ephestia kühniella. [3] 84: 367–80. **Chaudhuri, R. P.**—Studies on two aphid-transmitted viruses of leguminous crops. [4] 37: 342–54. **Farstad, C. W., A. W. Platt and A. J. McGinnis**—Influence of wheat varieties on the sex ratio of the wheat stem sawfly, Cephus cinctus Nort. (Hym., Cephidae). [80th Ann. Rpt. Ent. Soc. Ontario] pp. 27–30. **Florkin, M. et G. Duchâteau**—Concentrations cellulaire et plasmatique du potassium, du calcium et du magnésium chez une série d'animaux dulcicoles. [C. R. Soc. Biol.] 144: 1132–33. **Gardener, E. J.**—Head tumors in Drosophila melanogaster (Abstract). [Proc. Utah Acad. Sci.] 25: 164, 1948. **Gerebtzoff, M. A., M. J. Dallemagne et E. Philippot**—Plasmocytomes rénaux mutilples et plasmocytose à la suite d'injections répétées de DDT au chien. [C. R. Soc. Biol.] 144: 1135–37. **Gerhardinder, K.**—Über den Einfluss unterschiedlicher atmosphärischer Druckverhältnisse bei Rhescyntinae (Lep.). [Zeitschr. Wiener Ent. Ges.] 35: 89–99. **Grison, P. et G. Viel**—Variation de l'effet de produits insecticides en fonction du stade larvaire des Insectes. [C. R. Acad. Sci.] 231: 1090–92. **Grosch, D.**—Olfactometer experiments with male braconids. [5] 43: 334–42. **Haydak, M. H. and A. E. Vivino**—The changes in the thiamine, riboflavin, niacin and pantothenic acid content in the food of female honeybees

during growth with a note on the vitamin K activity of royal jelly and beebread. [5] 43: 361–67. **Howe, R. W.**—Studies on beetles of the family Ptinidae. 4. A note on the anomalous effect of parental age on the speed of development. [28] 86: 325. **Hrbácek, J.**—On the morphology and function of the antennae of the central European Hydrophilidae (Col.). [88] 101: 239–56, ill. **Jones, B. M.**—Acarine growth: a new ecdysial mechanism. [53] 166: 908–09, ill. **Kennedy, J. S. and C. O. Booth**—Methods for mass rearing and investigating the host relations of Aphis fabae Scop. [4] 37: 451–70. **Le Berre, J.-R.**—Action des facteurs climatiques sue l'incitation au vol du Doryphore (Leptinotarsa decemlineata). [C. R. Acad. Sci.] 231: 1096–98. **Lees, A. D.**—Diapause and photoperiodism in the fruit tree red spider mite (Metatetranychus ulmi Koch). [53] 166: 874–75. **Lefèvre, P. C.**—Bruchus obtectus Say ou bruche des haricots (Phaseolus vulgaris L.). [Publ. Inst. Agron. du Congo Belge (I. N. E. A. C.)] Ser. Sci. No. 48: 7–65. **Lienhart, R.**—Nouvelles recherches sur la reine des abeilles (Apis mellifica). [C. R. Soc. Biol.] 144: 1094–96. **Lord, K. A. and C. Potter**—Mechanism of action of organophosphorus compounds as insecticides. [53] 166: 893–94. **Mahdihassan, S.**—Bacterial symbiosis in Aphis rumicis. [Acta Ent. Mus. Nat. Pragae] 25: 123–26, ill., 1947. **Miller, L. W.**—Factors influencing diapause in the European red mite. (Paratetranychus pilosus C. and F.) [53] 166: 875. **O'Rourke, F. J.**—Formic acid production among the Formicidae. [5] 43: 437–43. **Posnette, A. F. and N. F. Robertson**—Virus diseases of cacao in West Africa. VI. Vector investigations. [4] 37: 263–84. **Rainey, R. C.**—The embryonic respiration of the sheep blowfly Lucilia sericata (Calliph.). [68] 25: 87–92, ill. **Schaller, F.**—Étude morphologique du complexe endocrine rétro-cérébral de la larve d'abeille (Apis mellifica L.). [C. R. Soc. Biol.] 144: 1097–1100, ill. **Smith, D. S.**—A study of some of the effects of certain food plants on the grasshopper Melanplus mexicanus mexicanus (Acrididae). [80th Ann. Rpt. Ent. Soc. Ontario] pp. 14–16. **Smith, K. M.**—Structure within polyhedra associated with insect virus disease. [53] 166: 861–62, ill. **Snodgrass, R. E.**—Comparative studies on the jaws of mandibulate arthropods. [82] 116 (No. 1): 1–85, ill. **Sternburg, J. and C. W. Kerns**—Degradation of DDT by resistant and susceptible strains of house flies. [5] 43: 444–58. **von Frisch, K.**—Bees, their vision, chemical senses, and language. Pp. viii + 119, ill. Cornell Univ. Press, Ithaca, N. Y., 1950. **Whiting, P. W. and R. Starrells**—

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ORTHOPTERA—Smith, D. S.—(See under Anatomy.) **Weber, N. A.**—(See under Anatomy.)

HEMIPTERA—Balduf, W. V.—(See under Anatomy.) **Broadbent, et al.**—(See under Anatomy.) **Chaudhuri, R. P.**—(See under Anatomy.) **Drake, C. J. and F. C. Hottes**—Saldidae of the Americas (Hemiptera). [Great Basin Nat.] 10: 51–61 (*), ill. **Dupuis, C.**—Sur une prétendue phase subimaginale dans le développement de certains Hémiptères-Hétéroptères. [C. R. Acad. Sci.] 231: 879–80. **Ferris, G. F.**—Atlas of Scale insects of North America. Series V. The Pseudococcidae (Part I). Stanford Univer. Press, Stanford, Cal. Pp. vii + 278, 108 full page figures. Price $7.50. **Hussey, R. F. and J. L. Herring**—A new Microvelia

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MIEREN door Prof. Dr. Alb. Raignier. (Eerste, tweede en derde Deel = Deel 18, 19 en 20 van *Wat leeft en groeit, de wereld van dieren en planten.*) Uitgegeven door de Uitgeverij Het Spectrum te Utrecht. 1950. Deel I: 141 pp., 16 photos, 27 figs. (unnumbered); Deel II: 101 pp., 8 photos, 2 tables, 2 graphs, 16 figs. (unnumbered); Deel III: 136 pp., 8 photos, 36 figs. (unnumbered) + 33 figs. (numbered).

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For those readers who might wish to learn more about ants, twenty well-selected references are included in Appendix I. In this section, entitled "Wat lees ik nog meer?", the names of the following well-known authors appear: R. Brun, F. Buytendijk, H. Donisthorpe, K. Escherich, A. Forel, W. Goetsch, A. Krausse, F. Maidl, H. Schmitz, A. Stärcke, E. Wasmann and W. M. Wheeler.

The binding is of tough, manilla-like paper. The format is 11 by 19 cm. The paper is of good quality. The illustrations by Gerard Huysser are with few exceptions all original. These illustrations are for the most part very well done. Some of the photos are closeups of living ants; these are exceptionally fine examples of small insect photography.

There is no date of impression to be found anywhere in the three volumes. I have listed 1950 as the date of issue, however, since I received the three volumes in one package sometime during the summer of 1950. I believe that Father Raignier sent them out shortly after they appeared in print.

Father Raignier, Father van Boven, the Illustrator and the publishers are to be congratulated on having produced an exceptionally fine little work on ants.—MERLE W. WING.

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